CLAIMS

What is claimed is:

1. An apparatus, comprising:

a single-crystal silicon active region fully or partially transparent to an optical signal;

a bulk silicon inactive region; and

a membrane coupling the single-crystal silicon active region to the bulk silicon inactive region,

the single-crystal silicon active region doped to make it electrically conductivein order to thermally tune the single-crystal silicon active region to pass a specific wavelength in response to the received optical signal.

2. The apparatus of claim 1, wherein the single-crystal silicon active region includes a p-type material dopant.

3. The apparatus of claim 2, wherein the single-crystal silicon active region includes a boron (B) dopant.

4. The apparatus of claim 1, wherein the single-crystal silicon active region includes an n-type material dopant.

5. The apparatus of claim 4, wherein the single-crystal silicon active region includes a phosphorous (P) dopant.

6. The apparatus of claim 4, wherein the single-crystal silicon active region includes an arsenic (As) dopant.

7. The apparatus of claim 1, wherein the membrane is a silicon nitride (SiN) membrane, with varying atomic ratios of silicon and nitrogen.

8. The apparatus of claim 1, wherein the membrane is a silicon oxide (SiO_2) membrane.

9. The apparatus of claim 1, further comprising a temperature sensor formed on the single-crystal silicon active region.

10. The apparatus of claim 10, further comprising a platinum temperature sensor formed on the single-crystal silicon active region.

11. The apparatus of claim 1, further comprising gold bond pads mounted to the perimeter of the single-crystal silicon active region.

12. The apparatus of claim 1, further comprising bond pads mounted to the top of the single-crystal silicon active region.

13. The apparatus of claim 1, further comprising bond pads mounted to the bottom of the single-crystal silicon active region.

14. A system, comprising:

a transponder having a wavelength-selective element, the wavelength-selective element having a single-crystal silicon active region adapted to receive an optical signal, a bulk silicon inactive region, and a membrane coupling the single-crystal silicon active region to the bulk silicon inactive region, the single-crystal silicon active region doped to make it both electrically conductive and thermally conductive the single-crystal silicon active region coupled so as to receive a current to thermally tune the single-crystal silicon active region to pass a wavelength in response to the received optical signal; and

an erbium-doped fiber amplifier (EDFA) coupled to the transponder.

15. The system of claim 14, further comprising a multiplexer coupled to the EDFA.

16. The system of claim 15, further comprising an add-drop multiplexer coupled to the EDFA.

17. A method, comprising:

adjusting resistivity of a doped silicon etalon ; and

applying a current to the doped silicon etalon to thermally tune the doped silicon etalon to select a wavelength in response to an incident optical signal.

18. The method of claim 17, further comprising applying a second current to the doped silicon etalon to thermally tune the doped silicon etalon to select a second wavelength.

19. The method of claim 18, further comprising sensing the temperature of the doped silicon etalon.

20. An apparatus, comprising:

a laser having:

a cavity; and

a doped silicon etalon positioned in the cavity.

21. The apparatus of claim 20, wherein the doped silicon etalon includes a p-type material dopant.

22. The apparatus of claim 21, wherein the doped silicon etalon includes a boron (B) dopant.

23. The apparatus of claim 20, wherein the doped silicon etalon includes an n-type material dopant.